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ZOOLOGY

Bird Migration Mystery Still Unsolved

By MARJORIE MACDILL,

The great marathon of the birds is now on! They are sweeping northward on the last lap of their long journey, propelled by the indefinable urge that takes them back to the scenes where they were born. Some have attained their goal and are already in the throes of nest building and family raising. Others loiter near our dooryard a day or two, enchant us with sporadic bursts of alien melody, and then pass on into the unknown.

Three weeks ago the barn swallow, twittering on the telephone wire, was circling the fields of Alabama. Two weeks before that he was in Porto Rico. The white throated sparrow, up from Georgia, lingers a week and precipitates many an attack of spring fever with his disturbing plaintive whistle, "Sweet, sweet, sweet, Canada, Canada, Canada." Tomorrow he will be gone and in another week he will be among the sharp-spired spruce trees and cold ice-fed streams of the North Woods.

Where Birds Spend the Winter

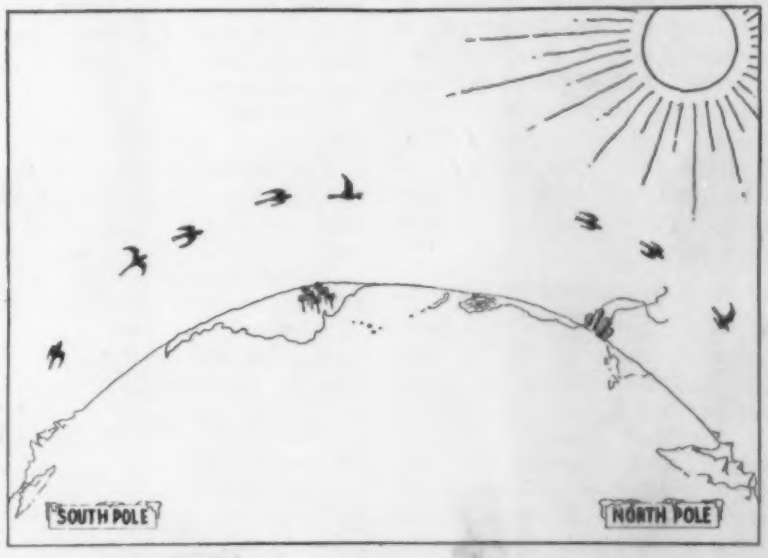
The wonder and the mystery of bird migration have attracted the interest of people since the beginning of history. Remarkable and manifold theories have been devised to account for the annual disappearance of birds in the fall and their reappearance with the rejuvenation of the earth in the spring. Chief among these has been the theory of hibernation which was first set down by Aristotle about 300 B. C. Birds, according to this idea, went into a torpid state in the fall and remained tucked away asleep in caves and hollow trees until the cold weather was over. Certain species, notably swallows, were thought to submerge in marshes and pass the winter ensconced in the mud at the bottom of ponds.

Some of the modern theories are fairly bizarre, and in many ways migration is as much of a mystery as ever, but the growing practice of bird banding and the careful observations of ornithologists in the field, are gradually uncovering considerable portions of the hidden half of bird life that transpires between September and March.

Dr. Alexander Wetmore, president of the American Ornithologists' Union and assistant secretary of the Smithsonian Institution, has spent long periods in the interior of southern South America, seeking the answer to some of the whens, wheres, and whys of bird migration that ornithologists have been struggling with for the last 200 years. He has been successful in answering several "wheres," and in adding his bit to the numerous scientific theories advanced as to the "why" of bird travels. But it would take a super-genius to work out an explanation to tell how a tiny warbler no bigger than one's thumb can fly across the Gulf of Mexico, or how the golden plover makes his marvelous non-stop flight of 2,400 miles over the Atlantic from Nova Scotia to the Lesser Antilles or the northeast coast of South America!

The barn swallow and the bobolink fly the farthest south of any of our well-known and familiar birds, according to Dr. Wetmore. These hardy little *voyageurs* invade the pampas of Argentina, making a round trip journey of over 10,000 miles there and back. A few lusty individuals of the yellow-billed cuckoos, olive-backed thrushes, nighthawks and cliff swallows get down into the Chaco of northern Argentina and Paraguay, but most of our erstwhile dooryard friends do not penetrate very far below the equator. Mexico is far south for a catbird or a bluebird, while our migrant orioles do not get much below Venezuela or Colombia.

(Just turn the page)



ARCTIC TERNS FLY 11,000 MILES from the Antarctic to their nesting grounds close to the North Pole. They manage to spend almost all their days in the light of the midnight sun.

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Bird Migration

Long distance bird fliers who penetrate into the interior of Argentina and down into Patagonia apparently have mapped out three southward routes of travel. One via the Brazilian coast is patronized most by shore birds. A second is along the Pacific, taking in the mountaian scenery of the Andes, while the third is south along the interior river systems. They follow the advance of the southern spring below the equator, disport themselves in the southern summer while it is winter here, and retreat back toward their nesting grounds with the coming of the northern spring. Thus they manage to keep in an eternal Palm Beach atmosphere of spring and summer.

It is no wonder so many of the ancient pagans timed their festivals of rejoicing at the return of spring by the reappearance of the migrating birds. In Macedonia today bands of children pass from house to house at the beginning of March carrying a swallow carved out of wood and singing that the swallows have returned and with them the spring.

Chippeway Indians evolved a New-World bluebird of happiness myth all their own, in their belief that the bluebird brought summer back to them on his azure wings.

Causes of Migration Still Unknown

The regularity of the reappearance of birds every spring in their familiar chosen haunts for home building has led to many theories to account for their amazing sense of direction. Some scientists say that they have a magnetic sense and are drawn toward a magnetic pole. Others maintain that a nasal sense enables them to identify air currents. Telepathy and hereditary memory are other vicarious suggestions that have

(*Continued on page 277*)

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Photographs aid in the telling of the week's science.

Great care is taken to keep its editorial content not only *interesting* but *accurate* as to fact and implication.

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National Academy Meeting Draws Science Leaders

Below are reported some of the important papers presented at the annual meeting of the National Academy of Sciences, which took place in Washington, April 25-27.

"Athens of Southwest"

Pueblo Bonito, four-story apartment house settlement in New Mexico, was the Athens of the Southwest 1,000 years ago. The artistry and skill of the Indians who made this masterpiece of primitive civil engineering were described before the National Academy of Sciences by Neil M. Judd, curator of American archæology at the U. S. National Museum, who has directed excavations at Pueblo Bonito during the past six years.

The excavations, which have been conducted under the auspices of the National Geographic Society, have revealed that this unique Indian city went through four major periods of building activity, and two distinct groups of similar yet unrelated Indians were responsible for the prodigious construction projects, Mr. Judd said.

"Those of the first group," he said, "dwelt for several generations in their moon-shaped pueblo before the second group arrived, presumably by invitation, and introduced superior architectural and cultural practices that quickly won for Pueblo Bonito preeminence among all contemporaneous villages north of Mexico. All archæological evidence shows these two Indian peoples to have been entirely distinct and independent from each other. And yet they dwelt side by side and lived the same sort of life in the same terraced town."

The first residents of the community were conservatives and built small low-ceiled rooms with rough sandstone slabs, adding on rooms as their families increased without any plan for regularity or design. The second group which came into the community set to work to build orderly dwellings, with the skill of master craftsmen, though they had no metal tools, no beasts of burden.

The newcomers first erected dwellings of hand-dressed stone, Mr. Judd explained, and filled the spaces between the stones with small chips or spalls. Later, however, they evolved a more artistic masonry by laying the large dressed blocks in horizontal bands. And, finally, they found that laminate sandstone with uniform, natural cleavage required much less reshaping, and yet made more secure, equally attractive walls than did the softer, irregular blocks, which must be squared with stone hammers before placement.

While the late comers developed three outstanding types of masonry the old original settlers continued to build in the crude and more hazardous fashion of piling up stones, bequeathed to them by their ancestors.

Pueblo Bonito had nearly 800 rooms and sheltered between 1,200 and 1,500 individuals, Mr. Judd states. Archæological evidence points to its abandonment approximately 1000 years ago.

The past season's work at the prehistoric pueblo centered chiefly on the architecture of the structure. Mr. Judd expects to return to Pueblo Bonito within a few weeks, in order to complete his reports of the project.

Moon Lacks Common Rock

What the moon is made of, favorite mystery ever since the days when it was supposed to be made of green cheese, is more nearly being answered than ever before. The studies of Dr. F. E. Wright, of the Geophysical Laboratory of the Carnegie Institution of Washington, which he described at the meeting indicate that the surface of the moon consists of such rock as pumice and granite, with no basalt.

Dr. Wright is a member of a joint committee of astronomers, geologists, and geophysicists of the Carnegie Institution of Washington, that is investigating the moon. His study was made by the use of polarized light. Ordinary light waves vibrate up and down and left and right and in all possible combinations of these directions, but when passed through a special prism, or reflected at certain angles, are reduced to vibrations in a single plane. This is called polarized light.

Unlike direct sunlight, the light from the moon is partly polarized by reflection on the moon's surface, and by determining the degree of polarization, it is possible to learn something of the nature of the reflecting surface.

At different phases of the moon, the light is reflected to the earth at different angles, and by comparing with it the polarization of light reflected from earthly rock surfaces, Dr. Wright has found that rocks containing large amounts of silica, such as pumice, granite, quartz-porphyry, as well as sulphur and powders of transparent substances, polarize light reflected from their surfaces much in the same way as the moon does. But basalt, a rock due to volcanic causes, affects the light quite differently.

At best, however, says Dr. Wright, the amount of polarized light reflected from the moon is very slight, and at new moon and full moon is practically absent.

Grand Canyon Yields Fossils

The fossil-bearing rocks of the Grand Canyon, which have recently aroused much interest because of the discovery in them of footprints of long-extinct animals, are now yielding remains of the leaves and stems of plants among which these animals roamed and fed, many millions of years ago. Dr. David White, of the U. S. Geological Survey, told of his examination and identification of many specimens from this region.

The plants that grew on the ancient floodplain of red sand through which the great gash of the Grand Canyon has since been cut were very little like the ones that grow in the forests of today. Their nearest relatives still living are the ferns and the tropical cycads and similar plants.

The plant remains were all preserved by being deposited at the bottoms of streams or ponds, but there is evidence, says Dr. White, that these bodies of water were not permanent, but appeared during rainy seasons and dried up when the rains ceased, just as most of the streams and ponds in the arid Southwest do to this day. Pressed between thin layers of water-deposited sand that gradually hardened into strata of sandstone, the leaf and stem fragments were preserved like botanical specimens in a huge book, and even after their own substance had gradually decayed and almost wholly vanished, their imprints were left on the stone just as the print of a pressed flower is sometimes left between the pages of an old volume, shelved many years ago and never opened.

The knowledge gained by scientists about the ancient animals of the Grand Canyon region was summarized and brought down to date by Dr. Charles W. Gilmore of the

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National Academy

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U. S. National Museum. Footprints of extinct reptiles and amphibians have been found in three distinct formations, he told his fellow-scientists. These are known respectively as the Coconino, Hermit and Supai formations. Thirty-three species were represented by tracks in these three levels, 22 species in the Coconino, 8 in the Hermit formation, which also yielded all the plant fossils studied by Dr. White, and 3 species of animals in the Supai. Remains of insects were found for the first time in the Hermit formation. More than two tons of stone slabs bearing fossil footprints are now in the U. S. National Museum.

"Death Whisper's" Tricks

"Death whisper" waves of sound of such high frequency that they can not be heard, though they are capable of killing small animals and of breaking down the corpuscles of blood, have been put through some strange new antics by Prof. R. W. Wood of the Johns Hopkins University and A. L. Loomis, of Tuxedo Park, N. Y., at the latter's private laboratory. The newest experiments of the two investigators were reported by Prof. Wood, before the annual meeting of the National Academy of Sciences.

These rays of inaudible sound waves are produced from slices of quartz crystal, driven by oscillating electric currents of frequencies of around 500,000 a second. They travel through any liquid or solid object and heat it as they go, but do not come out into the air. Blood corpuscles in a physiological salt solution are broken down, tingeing the whole body of the fluid a clear red; but if a tiny particle of gelatin—half a per cent or less—is added it somehow protects the corpuscles and they are not broken.

If a block of artificially frozen ice is subjected to their action, the waves have no apparent effect on it until it is placed under pressure, when it at once breaks into a mass of tiny crystals. But a piece of pond ice, frozen under different conditions, resisted the waves and did not crumble. Prof. Wood has no explanation to offer, as yet, for this difference in behavior. Finely powdered solids, stirred up in water to make a suspension, are driven together by the waves, until they form a closely packed round mass just under the surface.

Things that can not ordinarily be mixed with water, like oil, paraffin and mercury, are forced by the vibrations to become exceedingly fine suspensions or emulsions. A paraffin candle was floated on water and the current turned on. The wax melted from the surface and came down into the liquid in the form of a cloud of microscopic white drops, forming a veritable paraffin milk that could not be distinguished in appearance from real milk. In another experiment, a little mercury was poured on the bottom of the beaker full of water. The waves broke it up into drops so small that they could just be seen with the highest power of the microscope, scattered evenly through the water in a dense cloud. This mercury-water emulsion was as black as ink. Prof. Wood believes that a possible future application of this newly discovered power of the "death whisper" may be to create emulsions out of combinations of liquids that can not be forced to mix in any other way.

Weight Lost in Breath

The loss in weight that we all undergo every day, mostly water given off through the skin and lungs, has been the object of research by Dr. Francis G. Benedict and Cornelia Gollay Benedict of the Carnegie Institution of Washington, who reported at the meeting. Two sensitive balances were used in the work. Both were strong enough to sustain the weight of a man, but sensitive enough to register small changes in weight. One of the balances would indicate a change of one-third of an ounce, and was so constructed that the volunteer for the experiment could sleep all night on its platform. The other was a hundred times as sensitive, but could be occupied for only an hour or so at a stretch.

The total moisture losses of this class from a woman of average weight were found to average around 30 grams, or one ounce, per hour; for a man the figure was about one-third higher. An auxiliary device permitted the separate measurement of losses from the lungs and skin, and while these varied among individuals and from time to time in the same individual, they averaged 50 per cent. from each source of water loss. Other ingenious mechanisms measured the carbon dioxide given off, the percentage of water in the outgoing breath, and also its temperature.

Measures Tiny Temperature

Using an electrical heat-measuring device so incredibly delicate that it is sensitive to two trillionths of an ampere of current and will measure temperature changes of as little as one ten-millionth of a degree Centigrade, Dr. A. V. Hill of the Cornell University has measured the temperature changes in nerve fibers during their activity. In describing his experiments before the academy he stated that his object had been to learn more about the nature of nervous action. Older theories have held that nervous impulses were not like other physiological processes, but were physical waves like light or radio waves. These ideas were based on the absence of any detectable heat given off by nerves as a result of stimulation. But with the extremely sensitive instrument devised by Dr. Hill it is possible to measure the almost vanishingly minute temperature rise that occurs in a single nerve fiber when it is caused to react. The moment of activity of a nerve is followed by a prolonged period of recovery, during which nine times the initial amount of heat is given off.

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It is said that certain kinds of bacteria convert fertile soils into alkali wastes.

Motor bus routes in the United States now cover a greater mileage than railroads.

The hottest stars probably reach a temperature as high as 40,000 degrees Fahrenheit.

Ruins of the buried city of Pompeii were discovered in 1748 by peasants digging in a field.

An exhibition of cooking gas was given at the Centennial Exposition in Philadelphia in 1876.

The warlike Amazon ants make raids on brown ant colonies and capture slaves to wait on them.

Census figures show that in 1925 almost 24,000,000 radio tubes were manufactured, as compared with about 4,600,000 in 1923.

Ancient astronomers named the stars and constellations, but the clouds were first named and classified by an Englishman in 1803.

PHYSICS

Physicists Discuss Latest Advances

Following are reports of some of the highlights of the meeting of the American Physical Society by James Stokley. The meeting was held in Washington, April 22 and 23.

New Gravity Value

Astronomers can figure a little more accurately with how much force the earth and the moon pull on each other by gravity; or physicists can figure out more accurately the force with which their bodies would be pulled to the earth if they fell out of a second story window. This can now be done by means of the new value of what scientists call the "gravitational constant" announced at the meeting of the American Physical Society by Dr. Paul R. Heyl, of the U. S. Bureau of Standards.

As a result of three years' work, much of which was done in a subterranean chamber at the Bureau of Standards, Dr. Heyl has found this constant to be expressed by the fraction 6.664 over 100,000,000. The law of gravitation, stated many years ago by Sir Isaac Newton, says that two masses of matter attract each other by a force which is greater as they are more massive, and less as the distance between them becomes greater. The exact force is found mathematically by multiplying the masses of the two bodies by each other, and dividing by the distance, and then multiplying the result by the gravitational constant. As exact knowledge of the force of gravity is important in many different branches of science, all the way from study of projectiles fired from guns to study of the motions of the stars, the gravitational constant, which the physicist calls G, must be known very precisely.

About 1740 a Frenchman, named Pierre Bouguer, made the first attempt to measure G by experiment, but the first determination of value was made a quarter of a century later by an English astronomer, Nevil Maskelyne. His method was to observe a plumb bob on two sides of a mountain. The mass of the mountain tended to pull the bob towards it, and by measuring the deflection of the plumb line from exact vertical by comparisons with the positions of the stars, and knowing roughly the mass of the mountain, a value could be obtained. It was not very accurate, however, because the mass of the mountain could not be more than guessed at.

At the end of the 18th century, another English scientist, Henry Cavendish, used for the first time the method now employed by Dr. Heyl. By this system, two tiny masses are attached to the end of a rod, which is balanced at the end of a long wire. Two heavy spheres of lead near the ends of the rod pull on the little masses and twist the wire slightly. This twist can be measured by a little mirror attached to the wire. A spot of light may be reflected by this mirror across the room, and a slight twist will produce a much larger motion of the spot of light.

Essentially, this was the same method that Dr. Heyl has employed, but with the aid of all the improvements to be offered by a modern research laboratory. Previous to this, the most accurate result had been obtained by Prof. C. V. Boys, another Englishman, and an Austrian priest, Father K. Braun, who worked independently, each in his own country, about 1895. They both obtained the same result, with G equalling 6.66 divided by a hundred million.

In 1901, Dr. G. K. Burgess, now the director of the Bureau of Standards, in working for his doctor's degree at the Sorbonne, Paris, tried the experiment, and obtained 6.64 instead of 6.66, but as this was done under pressure of time, it was not very accurate. Dr. Burgess realized this, and when he became director of the Bureau, he saw to it that the experiment was performed more accurately than had ever been done before. This Dr. Heyl has now completed, confirming, as far as they went, the results of Prof. Boys and Father Braun, and carrying the value to another decimal place in accuracy.

Photoelectric Promptness

Dr. Heyl was not the only scientist who told the physicists about very small amounts, for when light falls on a surface of potassium metal, electrons, the minute atoms of electricity of which matter itself ultimately consists, start coming off the surface less than 3 one-billionths of a second later. This was announced by Drs. Ernest O. Lawrence and J. W. Beams, who have been working in the physical laboratory of

(*Just turn the page*)

PSYCHOLOGY

ROBERT MEARNS YERKES

Simian Intelligence Tester

Many psychologists have devoted their energies to measuring the intelligence of human beings, from the youngest babies to mature adults, but Dr. Yerkes has done even more. During the war he was prominent in producing the army mental tests, but since then he has gone from human beings to an almost equally interesting group—the monkeys. Working first with chimpanzees, the chance finally came to make the first psychological study of a gorilla.

When Ben Burbridge returned to his home in Florida with Congo, a young mountain gorilla from Africa, the capture of which is depicted in a popular motion picture, Dr. Yerkes made two separate trips to Mr. Burbridge's home to meet and interview Congo. His results give an entirely new idea of gorilla intelligence, and show that the animal is not the vicious mankiller which we imagine him to be. The gorilla's bad reputation comes only from the tales of hunters who have seen the animal when he was fighting for his life, and are hardly a fair criterion.

Dr. Yerkes was born in Breadysville, Pa., on May 26, 1876, and graduated from Ursinus in 1897. In 1902 he received the Ph. D. from Harvard, After a number of years at Harvard, and as psychologist of the Boston Psychopathic Hospital, he went into military service during the war. After this he organized and ran the Research Information Service of the National Research Council until 1924, when he became professor of psychology at Yale.

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WOO	John Wanamaker, Philadelphia, Pa.
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SCIENCE SERVICE

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Physical Society

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Yale. The importance of this study lies in the fact that the electric current which results from these light-liberated electrons makes television possible. Any lag that may be produced in transmitting faces of photographs by telephone or radio will not come from sluggishness in the electrons leaving the sensitive potassium surface of the photoelectric cell.

Jovian "Northern Lights?"

"Northern lights" on Jupiter may explain why that planet appears so much brighter than it should, if all the light from it is reflected sunlight, and if it isn't any lighter in color than a respectable planet should be. This was the suggestion made by Dr. W. F. G. Swann, director of the Sloan Physical Laboratory of Yale University. Dr. Swann thinks that a rapidly spinning sphere, even though it be of some material such as copper, which is not ordinarily magnetic, will become magnetized by its motion.

He works out his theory by a modification of the laws of electrodynamics, and by it explains not only the magnetism of the earth, but also that which is known to be associated with sunspots. These spots are like tornadoes on the earth, whirling masses of gas, and at the edge of the spot the whirling would cause magnetism, just as in a sphere of the same diameter, according to Dr. Swann's theory.

By what is known as the Zeeman effect, after the Dutch scientist who discovered it, it is possible to tell whether light from the sun started from a magnetic area or not. By studies at the Mt. Wilson observatory in California, and other places, scientists have learned how magnetic the spots on the sun really are.

According to the theory, magnetism as much as that observed, would be associated with the spots if their edges rotated with a speed of about 50 miles a second. While great, this speed is not unreasonable for a sunspot.

The magnetism of the earth is thus rather slight, because of our globe's comparatively small size and slow rotation, but the planet Jupiter, which is 87,000 miles in diameter, and revolves once in 10 hours instead of 24, has a tremendous surface motion. And by Dr. Swann's theory, this would cause an extremely intense magnetic field on Jupiter. Magnetic intensity is measured by a unit called the gauss; at the poles of the earth the intensity is about half a gauss, but at the poles of Jupiter, thinks Dr. Swann, it would be about 60,000 gausses.

As the light from Jupiter is scarcely bright enough to show any Zeeman effect, it is difficult to get any knowledge of the magnetization of the planet, but the aurora borealis, or "Northern Lights" are due to the earth's magnetism. Electrons, rapidly moving particles of electricity, are constantly bombarding the earth from the sun, and outside space, and as they get near the earth, the magnetic field pulls them in towards us, causing glow in the highly rarefied gases high overhead.

With the much greater magnetism of Jupiter, thinks Dr. Swann, many more electrons would be drawn in to the planet, and the "northern lights" there would be much brighter than any we see on the earth. Astronomers have observed that Jupiter is usually bright, compared with the other planets, if all its light is reflected sunlight, and have supposed that it might be giving out some light of its own. Dr. Swann makes the suggestion that the planet is surrounded by an intense aurora, which accounts for the great brightness.

Science News-Letter, April 30, 1927

American made shoes go out to 87 different foreign countries.

Aluminum street cars are said to be almost one-fourth lighter than steel cars.

Indians of the northwest used bark to make rope and to weave mats and blankets.

Naturalists say that chimpanzees and some monkeys laugh when they are pleased.

Two German firms are considering a weekly passenger air service across the Atlantic.

As recently as 1839 in this country a boy was put to death by law for stealing a sheep.

Thousands of pounds of citric acid are recovered from pineapple waste in California each year.

The radiator of an automobile goes through more than 2,000 steps in the manufacturing process.

American Philosophical Society 200 Years Old

The following articles tell of some of the most significant achievements of science reported at the bicentenary meeting of the American Philosophical Society in Philadelphia, April 28-30.

The oldest scientific society in the United States, and one of the oldest in the world, has begun its third century of existence with the meeting of the American Philosophical Society. This society, founded by Benjamin Franklin, still meets in the same building which was constructed during Franklin's lifetime—one of the historic group of structures which includes Independence Hall.

When Franklin founded the organization in 1727 he probably never supposed that it would develop into anything as ambitious or long-lived as it did, for he tells of it in his autobiography as follows: "I had form'd most of my ingenious acquaintance into a club of mutual improvement, which we called the Junto; we met on Friday evenings. The rules that I drew up required that every member, in his turn, should produce one or more queries on any point of morals, politics, or natural philosophy, to be discussed by the company; and once in three months produce and read an essay of his own writing, on any subject he pleased."

By 1743 the club developed into a genuine learned society, the American Philosophical Society, and in 1771, while Franklin was again president, the society published its first volume of Transactions, which has been continued to the present. Nearly a hundred pages of the first volume is devoted to an essay on wine making, which the author, "Hon. Edward Antill, Esq., of New Jersey," recommends as a worthy occupation for the colonies.

During the American revolution, the society and its members were in prominence, and the first time the Declaration of Independence was read to the public, it was given from a platform which the members of the society had erected to observe the transit of Venus in 1769.

Photoelectric Halftone Cuts

The photoelectric cell, in which light is turned into electricity, and which makes television and the sending of photographs by telephone lines possible, may be of use in photoengraving, in making illustrations such as those in this paper. Dr. Herbert E. Ives, of the Bell Telephone Laboratories in New York, who has been in charge of the development of these telephotograph and television methods, told of the new system.

In sending photographs over wire, use is made of a "light valve," which gets larger or smaller as the parts of the original picture over which the photoelectric cell passes vary in brightness. To use this for photoengraving, Dr. Ives suggests that a series of instantaneous photographs be made of the opening of the light valve on the plate. In the method of engraving now in use, the invention of Dr. Ives' father, Frederic E. Ives, a screen ruled with cross lines is placed over the plate when the original picture is being photographed. This makes the picture consist of dots, which can be seen under a magnifying glass. Where the original is light, the dots are small, and where it is dark, the dots are large.

By the new method proposed by Dr. Herbert Ives, the series of photographs of the light valve would give the varying size dots. This, he claims, would produce halftones having exact renderings of the tones of the original.

Orchid Sanitarium

An orchid farm in Panama, containing one of the most famous collections of the costly blooms in the world, has just been presented to the Missouri Botanical Garden. It will be used as a tropical adjunct of the St. Louis garden.

To the 7,000 species included in the original gift orchids from all parts of the tropical world will be added. It is expected to become one of the most complete collections in existence, Dr. Moore stated. One of the great advantages of this tropical station will be its utilization as a sort of orchid hospital for the rescue of rare plants that have gradually succumbed to the adverse climate of Missouri. Some of these valuable plants have been sent to the Canal Zone to recuperate. They will be shipped back to the United States when they have acquired a new lease on life.

Saber-Tooth Tiger Find

The saber-toothed tigers that roamed California in ages past and were trapped in the La Brea asphalt pools as though on gigantic flypaper sheets, have a new cousin from South Dakota. A complete skull of one of these giant cats with dagger-like eyeteeth, known to scientists as Eusmilus, was found in Dakota by the Princeton University expedition last summer, and has been subjected to critical study during the past year by Prof. W. J. Sinclair, who reported to the Society. The huge curving upper eyeteeth of these animals, projecting downward past the lower jaw, were much too large to permit ordinary biting, and it is believed that they must have been used for slashing and tearing at the throat or other exposed vital parts of the prey. This particular genus of the saber-tooth tigers has hitherto been known only from a few scattered fragments, and the Princeton skull has afforded the first real chance for a complete examination.

May Predict Atlantic Storms

Radio prediction of storms crossing the Atlantic Ocean steamship and airplane routes, broadcast from Greenland several days before they get where they can do any damage, is a possibility of the future, according to Prof. W. H. Hobbs of the University of Michigan. Prof. Hobbs told of the work of an expedition from the University of Michigan to Greenland to study the effect of weather conditions there on Atlantic storms. He believes that these storms originate over the great ice cap of this northern island.

Last year preliminary studies were made, which will be continued this summer. A meteorological observatory, equipped with weather instruments as well as radio apparatus, will be established in southwestern Greenland, as near as possible to the ice cap, where two scientists will remain for a year. One of these is Prof. J. E. Church, Jr., who has been in charge of the Mt. Rose Meteorological Observatory, two miles high in the Sierra Nevadas of California. He is an authority on snow surveys. The expedition this year will be in cooperation with scientists from Iceland, Germany and Roumania.

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110 Metaphysics
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220 Bible
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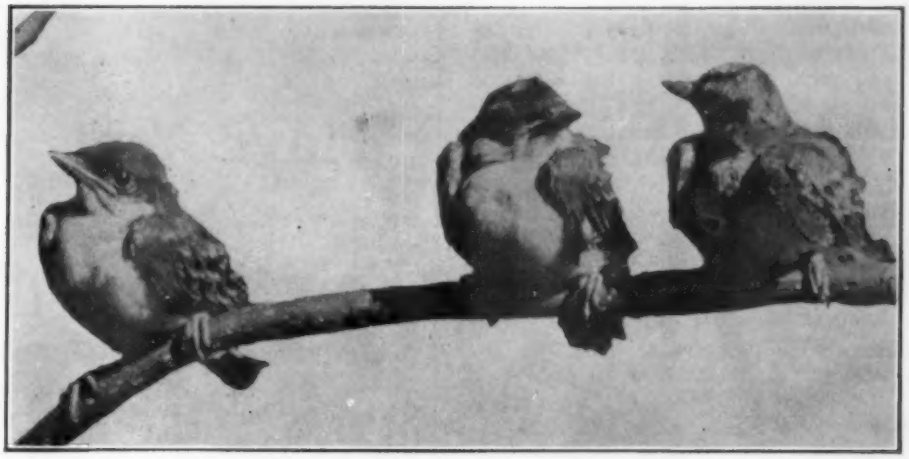

THE WARLIKE KINGBIRDS look aggressive even when they are babies. (Courtesy of U. S. Biological Survey).

Bird Migration

(*Continued from page 270*)

been advanced. It has also been suggested that they guide their course by the stars, the moon and the sun, though this does not take into consideration foggy weather. The faculty for orientation in carrier pigeons is well-known and has been developed by fanciers to an amazing degree in certain strains of birds by breeding. This problem of orientation will probably be eventually cleared up by experimentation, but at present no ornithologist has an explanation to offer that is very lucid or convincing.

The reason at the bottom of the long, long trek that the inmates of the bird house on the backyard fence take twice a year is a mystery that can be little more than guessed at. Science is as much in the dark as ever over why they do it. The entire act of migration, according to Dr. Wetmore, is so utterly complex that no single factor may be ascribed as the absolute cause. It has arisen, he believes, from movements induced by seasonal and climatic changes until it has become a hereditary instinct that is now actuated by physiological causes.

Birds Fly Low, Say Aviators

Early ornithologists used to think that most migration took place above 15,000 feet, putting their faith in the idea that flying was easier the higher up the birds were, that the difficulties of flight increased as they came nearer to earth. The experience of aviators shows, however, that just the opposite is true. With the greater altitude there is more difficulty in maintaining height and speed. This is partly due to motors, and though birds are exempt from the drawbacks of engine trouble, there is ample evidence that they feel the lack of buoyancy in the upper reaches. This condition has less effect on the broad-winged hawks, vultures and cranes with large wing surfaces, but operates heavily against the little fellows who must keep their tiny wings going rapidly to maintain flight.

Most migration is now thought to take place below 3,000 feet. Aviators rarely see birds above 5,000 feet, though some shore birds have been noted as high as 10,000 and 12,000 feet. In the Himalayas storks have been observed around 6,000 feet above the earth and 20,000 above sea level.

The greatest normal speed for a bird that has been recorded is held by the common swift of Eurasia, which was observed from an airplane to be jogging along at 70 miles without hurrying. Ducks and geese fly from 42 to 57 miles an hour, while the smaller perching birds, the flivvers of the bird world, range between 18 and 37 miles.

Some Like It Cold

The preference for perpetual spring displayed by the barn swallow, the bobolink and many other birds, is not shared by the Arctic tern, that makes the longest migratory flight known. Half way around the world apart are its summer and winter homes, for it makes its nest close to the North Pole, and has as a southern winter resort the icebergs of the Antarctic. The eleven-thousand-mile jaunt, changing from northern to southern ice fields and vice versa, brings the Arctic tern his longest contacts with darkness. In his daily life around the poles he lives in the almost continuous though chilly light of the midnight sun.

The nest of another bird of the North, the surf bird of Alaska, has recently been discovered for the first time. Though he spends most of his life on the rocky reefs of the Pacific Ocean, the surf bird turns to the mountains when he wants to raise a family. His home site was discovered for the first time last summer on Mount McKinley, by scientists from the University of California. Father surf bird, they found, is a model husband. He not only does most of the hatching of the eggs, but is much the more ardent defender of the home when it is beset by marauders. Mother is an emancipated woman who disports herself with her friends a considerable share of the time, stopping in only occasionally to relieve Father in keeping the eggs warm when he has to go out for a bite to eat.

Private Life of House Wrens

A kind of ornithological detective agency located near the outskirts of Cleveland, Ohio, has brought to light many previously unsuspected facts about the actions and movements of birds that may eventually shed some light on the migration problem. The tradition of lifelong mating, or of the remating of birds with the return to the old familiar nesting grounds in the spring, is pretty much of a fallacy with some species, according to S. Prentiss Baldwin, the Cleveland ornithologist who has made an intensive study of house wrens. His researches show that the services of a trained genealogist would be required to keep straight the exact degree of relationship in three generations of house wrens, so complicated are their intermarriages.

Plenty of food, water, and bird houses plus freedom from cats and English sparrows attract large numbers of wrens every year to his farm, where Mr. Baldwin plays Sherlock Holmes with a corps of Dr. Watsons in the shape of young students of ornithology to help him.

(*Just turn the page*)

FATHER ROBIN pridefully regards his offspring.

Bird Migration

(*Continued from page 277*)

They watch the courtship and domestic controversies of the occupants of every bird house, keep a record of each egg and, when it hatches, weigh the young bird and tag him with an identification band. This enables them to keep track of his movements as long as he continues to sojourn around those parts. Expert handling is necessary not to break the eggs, yet not one young bird has been lost as the result of having his "hospital" record taken. With careful treatment the wrens become accustomed to this impertinent surveillance of the intimate details of their family life, which leaves them about as much privacy as a gold fish, and they even grow to expect the daily inspection of their homes. Invaluable data on the nesting habits, the period of incubation and insight into the private life of wrens generally have been gained by this intensive study of typical bird life.

Bird Banding Traces Migration

Much of the mystery of the movements of birds during migration has been cleared up by the gigantic system of bird census-taking instituted by the U. S. Biological Survey, known as bird banding. Tempted by an alluring display of food, birds are enticed into large wire traps where the operator secures his "prey" and attaches a numbered aluminum band to the leg. This serves as an identification tag by which the movements of that particular bird are traced at any other trapping stations where he may happen to stop.

Birds have a highly sensitized nervous mechanism, and gentle and intelligent handling during the banding process is a factor of prime importance. It is needless to state that those that are roughly approached never come back, while the data afforded by the banding of birds that receive injury is of no value. They respond to kindly treatment, however, and there are records of many that return to the same locality year after year who use the traps as a sort of restaurant where they become regular patrons.

Any bird student over eighteen years old, who satisfies the authorities of the Biological Survey that he is competent to identify birds and turn in the desired information, may receive a federal permit to operate a trapping station. He should record the number and name of every bird he bands as well as that of every "return" and every visitor to the station who already has a band. This information is sent to the U. S. Biological Survey where it is filed and analyzed by experts working on the migration problem. From this source ornithologists expect some day to get answers to such questions as, how long birds live, how long birds stay married, how fast they travel during the migratory season, and others of greater scientific import, if of less sociological interest.

Science News-Letter, April 30, 1927

The first men in Scotland came there about 9,000 years ago, a British anthropologist has concluded.

Mt. Izalco, in Salvador, is said to be growing 50 feet taller each year, as a result of volcanic eruption.

A machine which makes cobwebs out of liquid rubber, ether, and glue is an aid to realism in the movies.

The number of ostriches in British South Africa has dropped from 776,000 in 1913 to 163,000 in 1925.

Belief that death from heart disease occurs without warning is discounted by figures showing that such deaths are usually preceded by at least ten years of disability.

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BIOLOGY

NATURE RAMBLINGS

By FRANK THONE

A Bug's-Eye View

Imagine yourself, if you can, in the position of a bug or beetle laboriously climbing a grass stem or stumbling along over the rough and pebbly ground. You haven't much sense (we are assuming you are completely a beetle, of course) and your small compound eyes are exceedingly near-sighted, so that you blunder up against mountainous clods, and with more persistence than judgment climb over them rather than go round.

Then you come to what looks like another clod. It is gray or brown, like the earth; it is completely motionless; it seems to be quite devoid of life. Too late you notice that its underside is white, as no clod is, and that at its summit there are two great, round, staring pop eyes looking at you with cold calculation. Then something like a sticky feather bed descends on you with lightning speed and force, you are jerked through the air, and—that is the end of you. The toad has whacked you with his protrusible tongue and licked you back into his wide mouth, the bourne from which no insect traveler returns.

Once in a while one of these live insect traps catches a Tartar. By way of experiment, a medium-sized but very peevish stag beetle was once offered to a large bullfrog who hadn't had a meal for two months. (Frogs and toads and their ilk can keep amazingly long Lents.) The frog instantly snapped up the beetle, which must have taken hold of his tongue or the lining of his throat with his formidable pincers as he went down. For the frog immediately displayed symptoms of most intense internal discomfort. But eventually he must have had the better of the argument, for the next day he appeared none the worse. And—evidence perhaps of a most astonishingly short memory—he snapped up another beetle (dehorned this time), as eagerly as he had swallowed the first.

Science News-Letter, April 30, 1927

RADIO

Greater Radio Accuracy

Radio measurements are now made a thousand times as accurately as four years ago. When in 1923 radio engineers made their measurements to an accuracy of 1 per cent., they now go to a thousandth of a per cent., Dr. J. H. Dellinger, in charge of the radio laboratory of the U. S. Bureau of Standards, told the meeting of the American section of the International Union of Scientific Radio Telegraphy, held in Washington recently.

Part of this increased accuracy has been due to the use of the piezo-electric oscillator, Dr. Dellinger explained. With this device a small crystal of quartz, between two metallic electrodes, can control the wave length of a broadcasting station to a considerable degree of accuracy. However, Dr. Dellinger stated, the use of the crystal by no means dispenses with careful adjustments. By the use of the crystal oscillator it is easily possible to obtain an accuracy of a tenth of a per cent., but for a higher degree of accuracy, all the conditions, such as the temperature of the crystal, must be carefully controlled.

If American and Canadian broadcasting stations do not keep to their proper wave lengths, it will not be for the lack of accurate standards, for Dr. Dellinger told of comparisons made by the Bureau of Standards with the Canadian radio authorities. One of the Bureau's standard crystal oscillators has been sent to Canada for comparison with their standards, and it has been found that the two agree to within a hundredth of one per cent.

M. S. Strock, also of the Bureau, told of their work in disseminating standard frequencies of radio waves. One way of doing this is by calibrating meters sent in by outside agencies with the Bureau's standards, but the most effective way is by the use of transmitting stations themselves. "The basis of this scheme," he said, "depends upon the fact that a standard of radio frequency may, neglecting the effects of interference, be transmitted over great distances and reproduced at the receiving station with an accuracy equal to that of the transmitter."

This method is used by sending out regularly standard frequency signals from the Bureau's station WWV. Careful check is kept also of the frequency of a selected list of stations near enough to Washington to be received directly at the Bureau. There are thirteen of these standard frequency stations, and in addition, a list of "constant frequency" stations, which includes about 5 per cent. of the stations of the country, are checked a little less carefully. Standard frequency signals have been broadcast from 6XBM, at Stanford University, California; 1XM, at the Massachusetts Institute of Technology, and 9XL, of the Gold Medal Flour Company, near Minneapolis.

Science News-Letter, April 30, 1927

PHYSICS

Sunspots and Radio

Radio reception is associated with spots on the sun, and with the earth's electricity and magnetism, but changes in one can hardly be used to predict changes in the others. Though the spots on the sun have been increasing for the last few years, and studies have been made as to how they correlate with radio reception, and the earth's magnetic and electrical conditions, no exact relationship exists, said Dr. Louis A. Bauer, of the Carnegie Institution. "Neither the number, area, nor position of spots on the sun's visible disc may be taken, however, as a safe index for the prediction of magnetic storms, or the production of electric currents in the earth's crust which are responsible for the interruptions in telegraphy," he said. "There have been notable magnetic storms when there were no spots on the sun's visible disc. The earth's magnetic activity does not cease during years of minimum or of almost no sunspottedness."

However, in the opinion of G. W. Pickard, radio engineer of Boston, there is a more definite relation between spots and radio, especially if the averages are taken over extended periods and thus compared. Over yearly periods, he says, reception varies with the earth's magnetism, which is greatest at autumnal and vernal equinoxes. The mean of 70 passages of large sunspot groups over the center of the solar disc shows that magnetic disturbances occur on the average when the spots are directly in line with the earth, he states.

Science News-Letter, April 30, 1927

A British company has been experimenting with the production of synthetic rubber for 14 years.

Pieces of potato weighing more than two ounces will grow more and better tubers than smaller seed pieces.

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THREE CENTURIES OF CHEMISTRY—Irvine Masson—*Macmillan*. From the beginning of experimental science with Francis Bacon the author tells of the rise of chemistry, the experimental science *par excellence*, to the present day.

Science News-Letter, April 30, 1927

GUIDE TO PHYSICS—John W. McCormack—*Globe*. A well arranged laboratory guide for high school classes.

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A LIST OF THE INSECT TYPES IN THE COLLECTIONS OF THE ILLINOIS STATE NATURAL HISTORY SURVEY AND THE UNIVERSITY OF ILLINOIS—Theodore H. Frison—*Illinois State Nat. Hist. Survey*. Of use to workers in systematic entomology.

Science News-Letter, April 30, 1927

DIRECTORY OF RESEARCH IN CHILD DEVELOPMENT—Compiled by Leslie R. Marston—*National Research Council* ($.50). This list of 425 workers in the field of child development shows in each case the full name, degree and where obtained, address, organization, specialties, and research problems, making a very serviceable Who's Who of these specialists.

Science News-Letter, April 30, 1927

RELATION OF BIRDS TO WOODLOTS—W. L. McAtee—*Roosevelt Wild Life Bull. v. 4, no. 1*. A worthy addition to a fine series, with many illustrations by Fuertes and Sawyer.

Science News-Letter, April 30, 1927

DOCTORATES CONFERRED IN THE SCIENCES BY AMERICAN UNIVERSITIES 1925-1926—Compiled by Callie Hull and Clarence J. West—*National Research Council* ($.50). The trend of scientific research in the different universities shown in this classified list of theses, which the National Research Council has compiled annually since 1920.

Science News-Letter, April 30, 1927

The U. S. Bureau of Fisheries rescues millions of fish each year from land-locked ponds caused by the overflow of the Mississippi and some of its tributaries.

PEDAGOGY

Education By Mail

Quotation from EDUCATION FOR ADULTS—Frederick Paul Keppel—Columbia University Press.

Not so long ago, when numbers were small, the question whether a given student was capable of profiting fully by such extra-mural courses as he might desire to take was relatively unimportant except to himself; and, as a matter of fact, he was pretty sure to profit, because, without his knowing it, he was the product of a process of selection. Even if he were not intellectually gifted, he had at least shown courage and initiative enough to swim against the current.

Today, however, the whole picture has changed. Students in adult education of various kinds have increased in number, not arithmetically but geometrically. The element of imitativeness, of which we all know the power, is in full operation. Young people are now subject to a terrific "selling" pressure. There are at least five thousand highly paid and highly skilled correspondence school salesmen at work all the time. One can hardly open a magazine without being faced either by an inspirational article in the reading matter or by an illustrated advertisement showing, for example, a young man who has taken somebody's correspondence course and is therefore sitting at the president's desk, from which he looks down with proud pity upon the shabby and cringing contemporary who failed to profit by his correspondence opportunities. In a word, we can no longer assume that men and women will enter adult education as a result of superior energy and power of deliberate decision any more than we can assume the students in our colleges to be impelled by the motive of intellectual interest. It is reported that nineteen out of twenty of the registrants in correspondence courses drop out before the completion of the course, and the mortality in all forms of extra-mural education is far higher than in regular courses, though the latter is high enough, in all conscience. Under the conditions necessarily controlling adult education, we must expect in any case a relatively high mortality, but is there anything we can do to keep it within bounds? For one thing, a way must be found to enable students to distinguish between *bona fide* correspondence schools and those which are simply swindles. It is a fact that anyone "who has published an article" can become a candidate for the Ph.D. degree in an institution legally empowered to grant that degree, the institution offering more than eight hundred courses, conducted by a faculty consisting of a man and his wife, both of them government clerks, aided by their only child.

Science News-Letter, April 30, 1927

GEOGRAPHY

First Printed Map

The first map of the world ever turned out by the printing press shows a fanciful, plate shaped universe, with Adam and Eve and the Tower of Babel much in evidence, according to Dr. H. Hassinger, professor of geography at the University of Basel, Switzerland.

In a lecture before the Geographical Society of Basel, Dr. Hassinger pointed out the strange fact that the art of printing, which was destined to promote knowledge, only helped to establish medieval ignorance by its first ventures into geography.

Three ancient maps contend for the honor of being the first picture of the world turned out by the fifteenth century press. One of these is in the Rockefeller Library, in New York. Another, very similar, was discovered by Dr. Hassinger in a volume which had belonged to the library of the reformer Vandadius.

These two maps, said Dr. Hassinger, are almost identical except for a few insignificant details. The maps were cut into wood by two German artists, and the text is in German. They contain some known geographical facts of the time, combined with fanciful ideas about the universe supplied by the best imaginations of the middle ages. Paradise, with four great streams flowing from it, holds a prominent place on this flat earth map. The known islands of the world are arranged in a circle around the mainland of the world.

The third map which geographers say was made at about the same time has Latin text, Dr. Hassinger said.

Science News-Letter, April 30, 1927

More copper has been produced in the world during the past 20 years than in the almost 7,000 years that copper has been known.

A naturalist who collected medicines in Chinese cities found evidence that remains of 85 different kinds of fossil animals were used.

PHOTOGRAPHS OF SCIENTISTS

Science Service has a collection of nearly 2,000 photographs of scientists throughout the world. The thirteenth installment of this list is published below. Although this list has been checked with care, corrections are requested, since a complete catalog will be issued later. Photographs of scientists not listed are desired.

For the convenience of teachers and scientific enthusiasts, these photographs are offered for sale. Any ten photographs (each postcard size 3⅛ x5⅜ inches) will be sent postpaid for only $2.00. Enlargements, 8 x 10 inches, are $1.00 each postpaid. Postcard pictures are finished only in black and white, but enlargements are offered either in black and white or sepia on buff stock. Please specify which.

Starred (*) photographs can be furnished as $1.00 enlargements only. Photographs at these prices are sold with the understanding that they are not to be used for publication.

U

10113* Ude, Johann, Zoology, Graz, Austria
1165 Uhlenhuth, E., Gen. Physiology, Univ. of Md.
1156 Ulrey, Albert B., Zoology, Univ. of So. Calif.
1389 Underwood, George R., Chemistry, American Glue Company
10114* Urbain, Chemistry, Univ. of Paris

V

10118* Vachet, P., Psychiatry, Paris
1337 Vale Vouk, Botany, Zagreb, Yougoslavia
1905 Van Alstyne, Lewis M., Botany, N. Y. Exp. Station
6101 Van Biesbroeck, George, Astronomy, Yerkes Obs.
90 Van der Heyde, H. C., Physiology, Univ. of Utrecht, Holland
829 Vanderlindey, H., Astronomy, Mt. Wilson Obs.
233 VanDuzee, E. P., Entomology, Calif. Acad. Science
767 VanDyke, E. C., Entomology, Univ. of California
830 Van Mannen, A., Astronomy, Mt. Wilson Observatory
514 Van Name, Willard G., Invert. Zoology, Am. Mus. Nat. Hist.
1406 Van Romburgh, P., Chemistry, Baarn, Holland
272 Van Rossem, Adriaan, Naturalist, Pasadena, Calif.
530 Van Slyke, Donald, Chemistry, Rockefeller Inst.
1350 Van Slogteren, E., Botany Bulb Laboratory, Holland
211 Van Slyke, E., Zoology, Univ. of California
224 Van Wagenen, Gertrude, Anatomy, Univ. of Calif.
1240 Varian, B. B., Dept. of Anatomy, Univ. of Pa.
508 Varrelman, F. A., Zoology, American Univ.
140 Veeder, Capt. John J., Steamship "Cayadetta," Woods Hole, Mass.
824 Veihmeyer, F. J., Irrigation, Univ. of California
10116* Vesalius, Andre
482 Vincent, George E., Sociology, Rockefeller Inst.
383 Vinson, Robert E., President, Western Res. Univ.
840 Visscher, Maurice, Physiology, Univ. of Minnesota
51 Visscher, Paul, Zoology, Johns Hopkins Univ.
10117* Viteles, Morris S., Psychology, Univ. of Penna.
1012 Voegtlin, Carl, Pharmacology, Hygienic Labortary
10139* Vonson, Carl G., Biochemistry, Boyce Thompson Inst.
380 Vorhies, Charles T., Entomology, Univ. of Arizona

W

635 Wachowaik, Marion, Bacteriology, St. Louis Univ. Med. School
759 Wagener, Mrs. E. H., Public Health, Univ. of Calif.
781 Wagener, Willis W., Pathology, U. S. Bureau of Plant Ind.
475 Waite, F. C., Anatomy, Western Res. Univ.
261 Waitzinger, L. A., Genetics, Univ. of California
6103 Walcott, Chas. D., Sec'y, Smithsonian Inst.
10120* Walcott, Mary Vaux, Botanical Artist, Wash., D. C.
839 Walden, George B., Chemist, Eli Lilly & Co.
415 Waldo, Leonard, Metallurgy, New York City
725 Walker, Ernest L., Med. Research, Hooper Found.
648 Walker, E. M., Biology, University of Toronto
552 Walker, T. L., Mineralogy, University of Toronto
1307 Waller, A. E., Botany, Ohio State Univ.
1294 Wallace, T., Chemistry, Univ. of Bristol, England
1338 Wallenweber, H. W. W., Pathology, Germany
1218 Walsh, L. S. N., Pathology, Washington Univ.
958 Walster, H. L., Agronomy, N. Dak. Agriculture College
1228 Walter, Herbert Eugene, Biology, Brown Univ.
842 Wann, F. B., Botany, Cornell Univ.
963 Ward, Henry B., Zoology, Univ. of Illinois
89 Warren, D. C., Genetics, Kansas State Agricultural College
157 Warren, Howard C., Psychology, Princeton Univ.
149 Warren, Shields, M.D., Harvard University
791 Washburn, E. W., Phys.-Chemistry, Nat. Research Council
548 Wasteneys, Hardolph, Exp. Biology, Univ. Toronto
619 Waterman, Warren G., Botany, Northwestern Univ.
339 Watson, E. C., Physics, Calif. Inst. of Tech.
563 Watt, James C., Anatony, Univ. of Toronto
263 Webber, Herbert John, Citriculture, Univ. of Calif.
641 Weber, C. J., Chemistry, St. Louis Med. Sch.
613 Weed, Alfred C., Fishes, Field Mus. of Nat. Hist.
1109 Weed, Lewis H., Anatomy, Johns Hopkins Med. School
1267 Weese, A. O., Zoology, Univ. of Oklahoma
10127* Weill-Halle, B., Medicine, Paris
166 Weinstein, Alexander, Genetics, Johns Hopkins Univ.
1177 Wells, G. P., Zoology, England
10119* Wendt, Gerald L., Chemistry, Penna. State College
468 Wenrich, D. H., Zoology, Univ. of Penna.
1332 Went, F. A. F. C., Plant Pathology, Holland
627 West, E. S., Biochemistry, Wash. Univ. Med. Sch.
1041 West, N., Exp. Physiology, Rockefeller Institute
119 Weston, W. H., Botany, Harvard University
1411 Wettstein, R., Botany, Univ. of Vienna, Austria
319 Weymouth, F. W., Physiology, Stanford Univ.
412 Whedon, Arthur D., Zoology, N. Dak. Agriculture College
466 Wheeler, William M., Zoology, Bussey Inst.
1308 Whetzel, H. H., Botany, Cornell Univ.
621 White, H. L., Physiology, Wash. Univ. Med. Sch.
97 Whiteside, Beatrice, Anatomy, Wash. U. Med. Sch.
85 Whiting, P. W., Genetics, Univ. of Maine
519 Whitlock, Herbert P., Mineralogy, Am. Mus. Nat. Hist.
581 Whitmore, Frank C., Organic Chemistry, Northwestern Univ.
629 Whitney, Caroline, Medicine, Wash. Univ. Med. Sch., St. Louis, Mo.
2053 Whitney, Leon F., Eugenics, Eugenics Soc. of Am.
1098 Whitney, F. L., Paleontology, Univ. of Texas
6011 Whitney, Willis Rodney, Elect. Eng., G. E. Co.
1003 Whitney, W. T., Physics, Calif. Inst .of Technology
1426 Wiegand, K. M., Botany, Cornell Univ.
464 Wieman, H. I., Zoology, Univ. of Cincinnati
1473 Wightman, E. P., Chemistry, Eastman Kodak Co.
890 Wilcox, Miss Marguerite S., Botany, Dept. of Agriculture
1033 Wile, Edith L., Physics-Chemistry, Rockefeller Inst.
1502 Williams, George A., Chemistry, Jefferson Med. College
271 Williams, W. H., Physics, University of California
444 Willier, B. H., Zoology, University of Chicago
403 Wilson, Chas. B., Biology, Westerfield, Mass.
6004 Wilson, H. C., Astronomy, Goodsell Observatory
1431 Wilson, W. P., Director of The Phila. Com. Museum
1470 Withrow, James R., Chemistry, Ohio State Univ.
1252 Wilson, D. Wright, Chemistry, Univ. of Penna.
949 Wilson E. B., Vital Statistics, Harvard Univ.
1155 Wilson, J. Walter, Zoology, Brown Univ.
861 Winkley, Ruth, Zoology, Univ. of Michigan
59 Wislocki, George B., Anatomy, Johns Hopkins Univ.
1232 Winslow, C. E. A., Public Health, Yale Univ.
94 Wissler, Clarke, Anthropology, Am. Mus. of Nat. Hist.
1286 Witschi, Emil, Zoology, Switzerland
1379 Wize, K., Mycology and Agronomy, Posen, Poland
765 Wood, Casey A., Ornithology, Univ. of Illinois
67 Wood, F. E., Zoology, Illinois Wesleyan Univ.
6024 Wood, R. W., Physics, Johns Hopkins Univ.
1495 Woodford, Miss Lois W., Editor, Chemical Foundation
814 Woodward, A. W., Geology, Pomona College
1293 Woodhead, T. W., Biology, England
427 Woodruff, L. L., Zoology, Yale Univ.
1317 Work, Paul, Vegetable Gardening, Cornell Univ.
317 Working, Earl B., Chemistry, Kan. State Agr. College
10125* Worman, Flair, Medicine, London
965 Worthington, A. G., Physics, Univ. of Pittsburgh
441 Wright, Sewell, Genetics, U. S. Dept. of Agric.
6005 Wright, W. H., Astronomy, Lick Observatory
184 Wulzen, Miss R., Physiology, Univ. of Calif.
1423 Wyman, Leland C., Physiology, Boston Univ. Sch. of Med.

(To be continued)

SCIENCE SERVICE

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Anniversaries of Science

May 4, 1503—The Pope issued a bull granting to the Spanish sovereigns all the land west of the line drawn from pole to pole at the distance of 100 leagues west of the Azores, and to Portugal all the land to be discovered to the east.

So far as Spain and Portugal were concerned this arrangement was an equitable one. Roughly speaking, the line thus drawn passed north and south through mid-Atlantic, and gave to each Power the countries they had been concerned in discovering. Had it remained unaltered, the whole of America would have fallen to Spain, and Malaysia, and Papua, and even Australia to Portugal. But it did not, for from the moment of its publication the latter Power remonstrated, fearing—although at the time nothing was of course known—that no share of the riches of the New World would fall to her.

—Guillemard: *Life of Ferdinand Magellan.*

Science News-Letter, April 30, 1927

May 5, 1827—Death of Laplace, author of the Nebular Hypothesis.

In the primitive state in which we have supposed the sun to be, it resembles those substances which are termed nebulae, which, when seen through telescopes, appear to be composed of a nucleus, more or less brilliant, surrounded by a nebulosity, which, by condensing on its surface, transforms it into a star. If all the stars are conceived to be similarly formed, we can suppose their anterior state of nebulosity to be preceded by other states, in which the nebulous matter was more or less diffuse, the nucleus being at the same time more or less brilliant. By going back in this manner, we shall arrive at a state of nebulosity so diffuse that its existence can with difficulty be conceived. . . .

But in what manner has the solar atmosphere determined the motions of rotation and revolution of the planets and satellites? If these bodies had penetrated deeply into this atmosphere, its resistance would cause them to fall on the sun. We may therefore suppose that the planets were formed at its successive limits, by the condensation of zones of vapours, which it must, while it was cooling, have abandoned in the plane of its equator.

—Laplace: *The System of the World,* translated by Harte.

Science News-Letter, April 30, 1927

May 6, 1856—Birth of Dr. Sigmund Freud, father of psychoanalysis.

Neuroses are foreign to you; since you are not doctors yourselves you have had access to them only through what I have told you. Of what use is the best judgment if it is not supported by familiarity with the material in question?

Do not, however, understand this as an announcement of dogmatic lectures which demand your unconditional belief. That would be a gross misunderstanding. I do not wish to convince you. I am out to stimulate your interest and shake your prejudices. If, in consequence of not knowing the facts, you are not in a position to judge, neither should you believe nor condemn. . . . .

We do not even demand that our patients should become convinced of and predisposed to psychoanalysis. When they do, they seem suspicious to us. The attitude we prefer in them is one of benevolent skepticism. Will you not try also to let the psychoanalytic conception develop in your mind beside the popular or "psychiatric"? They will influence each other, mutually measure their strength, and some day work themselves into a decision on your part.

On the other hand, you must not think for a moment that what I present to you as the psychoanalytic conception is a purely speculative system. Indeed, it is a sum total of experiences and observations, either their direct expression or their elaboration. Whether this elaboration is done adequately and whether the method is justifiable will be tested in the further progress of the science. After two and a half decades, now that I am fairly advanced in years, I may say that it was particularly difficult, intensive and all-absorbing work which yielded these observations.

—Freud: *Introduction to Psychoanalysis.*

Science News-Letter, April 30, 1927

PSYCHOLOGY—ZOOLOGY

Psychotherapy

This week's prize winning poem in the Science Service scientific poetry contest.

A lazy Sea Serpent was drifting
Down oceans of azure and gray,
When along swam a Shark, as dusk became dark,
Who lingered to bid him good day.

"Howdy-do?" asked the Shark of the Serpent;
"As usual," the Serpent replied,
"But news comes to me as I laze in the sea,
That casts a great gloom on my pride."

"It's sorry I am," said the Shark,
"For to hear that you're low in your mind;
Pray why, if you'll tell, is your spirit unwell?"
For even a Shark may be kind.

"Ah, grief's in my heart," sighed the Serpent,
"With sorrow, alas, it will break!
Mankind is misled, for rumor has said
That I am a mythical Snake!"

"How foolish," declared the Selachian,
"To feel so uncommonly sad;
Whatever they think, your pride needn't shrink;
You know you exist, so be glad."

The lazy Sea Serpent was drifting,
And smiled to himself as he swam,
"All folks may agree that there isn't a ME,
But I know very well that I AM!"

—*Richard Ashman.*

Science News-Letter, April 30, 1927

PHYSICS

Hydrogen Not Changed

The dream of the ancient alchemists, thought to have been realized by the transmutation of hydrogen into helium by Drs. Fritz Paneth and Peters, noted German chemists, has had to go back to the status of a dream once more, according to a report in the German scientific journal *Die Umschau.* Professor Paneth has himself retracted the claim that he changed one element into another, because of the discovery of two hitherto unsuspected sources of error in his apparatus. Ultra-minute quantities of helium were held adsorbed in a mass of asbestos, used in the apparatus, and a still smaller amount was dissolved in the glass tubing. These hidden traces of gas came out when heated, and infinitesimal in amount though they were, they registered their presence and thus led to the mistaken impression that helium had come into existence where none had been before.

Professor Paneth recently spent several months at Cornell University as non-resident lecturer in chemistry and much of his time was spent in research upon the problem of transmutation. His experiments were also repeated in the chemical laboratory at Princeton University with his cooperation. The Princeton chemists are understood to have been unable to bring about the transmutation of hydrogen into helium.

Science News-Letter, April 30, 1927

GEOPHYSICS

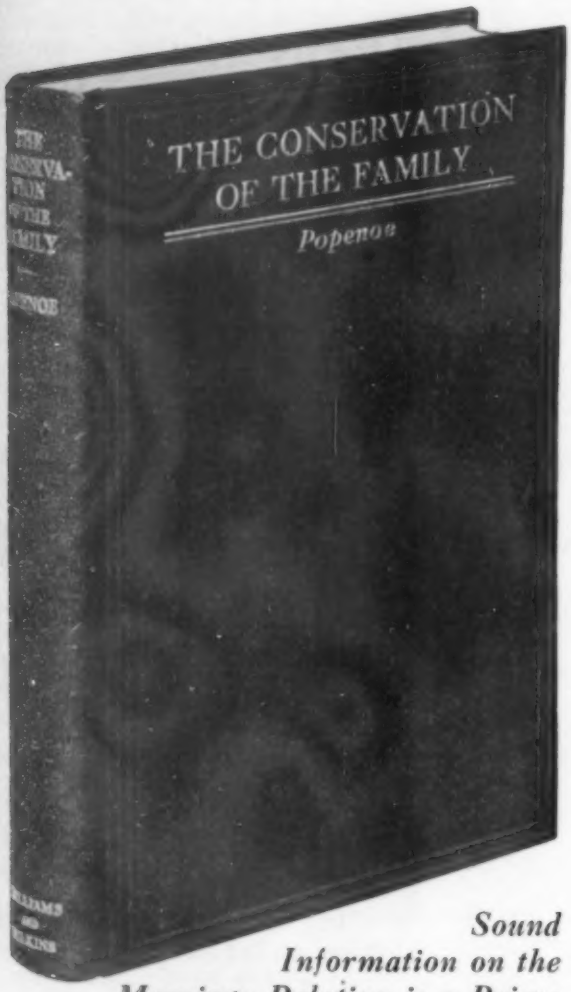
Borings Yield Steam Power

Boring for live steam as men bore for oil, with the possibilities of running engines and turning dynamos without the burning of a pound of fuel, according to Dr. Arthur L. Day of the Carnegie Institution of Washington. The steam wells described by Dr. Day are in Sonoma County, Calif., where operations have been going on for some time to exploit a field of hot springs and steam vents similar to those of Yellowstone National Park but on a smaller scale.

So far, Dr. Day states, five borings have been sunk. They reach depths of from 300 to 600 feet, yielding a total of nearly 5,000 horsepower of live steam. The temperatures at the bottoms of the wells vary from 160 to 185 degrees, and the pressures attain a maximum of 276 pounds per square inch. Besides steam, various gases come out of the wells.

Science News-Letter, April 30, 1927

"The Outstanding Book of the Year in the Field of Popular Sociology"—The Forecast.



Sound Information on the Marriage Relation is a Prime Necessity for a Happy Society

THERE are two things the reviewers are saying about Paul Popenoe's CONSERVATION OF THE FAMILY: One, That it compresses a remarkable amount of information in small space; the other, that this is accomplished with a high degree of literary skill.

Says the New York Times: "Learned and delightfully readable volume. . . . . It is remarkable how much Paul Popenoe has contrived to do and show in the extent of a single volume. He is not only a learned scientist but a literary craftsman of a high order. A perusal is not only an education in itself, but a literary treat. The benefits of a wide reading would be incalculable."

The Forecast: "Clear, logical, intensely interesting discussion of a subject never before presented with such comprehensive brevity."

Eugenical News: "Characterized by literary skill, by marked sanity, by excellent judgment, by high purpose."

Social Welfare: "The book is full of useful help, easy to read, and not without its lighter side, where humor can help illustrate a point."

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A FEW BOOKS WORTH THE HAVING

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By **Paul Popenoe.** A summary, in non-technical language of what has been learned by men of science about these problems.

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A symposium, edited by **Adolf Meyer,** which presents the point of view of twelve leading authorities, on various phases of the birth control movement.

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